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THE APPLICATION OF PROGRAMED INSTRUCTION TO FOREIGN LANGUAGE AND LITERACY TRAINING.

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SEVERAL SELF-INSTRUCTIONAL FOREIGN LANGUAGE TRAINING PROGRAMS DEVELOPED FOR MILITARY USE ARE DESCRIBED. THE APPLICATION OF PROGRAMED INSTRUCTION TECHNIQUES TO THE PEDAGOGICAL AND LINGUISTIC SKILLS UNDERLYING FOREIGN LANGUAGE TEACHING IS EXPLAINED. AN OVERVIEW OF SELF-INSTRUCTIONAL FOREIGN LANGUAGE TRAINING AND SOME OF THE PROGRAMED LANGUAGE MATERIALS AVAILABLE PROVIDE AN INDICATION OF THE EXTENT TO WHICH PROGRAMING HAS BEEN USED IN THIS FIELD IN THE UNITED STATES. A BRIEF DISCUSSION OF THE PROBLEMS INVOLVED IN THE APPLICATION OF PROGRAMING TO LITERACY TRAINING, PRIMARILY THE LACK OF READING KNOWLEDGE ON THE PART OF ADULT NATIVE SPEAKING STUDENTS, IS PRESENTED. THIS PAPER WAS PRESENTED AT THE NORTH ATLANTIC TREATY ORGANIZATION CONFERENCE ON "THE MILITARY APPLICATIONS OF PROGRAMMED INSTRUCTION" (NAPLES, APRIL 1965). (RS)

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The Application of Programed Instruction to Foreign Language and Literacy Training

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Prefatory Note

At the request of the NATO Science Committee, Dr. Eugene H. Rocklyn of HumRRO Division No. 7 (Language and Area Training), Alexandria, Virginia, presented this paper while participating in a Workshop at a NATO Conference on "The Military Applications of Programmed Instruction." The Conference, arranged by the Advisory Group on Human Factors, was held in Naples, Italy, April 20-23, 1965.

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THE APPLICATION OF PROGRAMED INSTRUCTION TO FOREIGN LANGUAGE AND LITERACY TRAINING

Eugene H. Rocklyn

This paper will begin with a description of some self-instructional foreign language training programs developed for military usage in our research organization. Examples will be given showing how programed instruction techniques were applied to the pedagogical and linguistic principles underlying foreign language instruction in these programs. Then a brief overview of self-instructional foreign language training and some of the programed language materials available should give an indication of the extent to which programed instruction has been and is being applied to foreign language training in the United States.

Finally, the major problem in applying programed instruction techniques to literacy training will be briefly discussed.

The difference in the amount of coverage placed on these two subject matters, foreign language and literacy training, reflects the immediate advantages programed instruction has for foreign language training as compared to literacy training and for that matter, to almost all other subject matters. These advantages are (a) foreign language courses programed for completely self-instructional use eliminate the problem of securing native or highly trained foreign language speakers as instructors, and (b) learning a foreign language is to a great extent a laborious process of acquiring motor skills through actual practice of a repeated nature. Programed language courses can provide such repeated opportunities for actual responding in a favorable learning environment.

The first such language training program to be discussed (1) was constructed to help solve a related pair of combat communication problems. The immediate acquisition of perishable information from newly captured POWs may aid the combat soldier in carrying out his mission and in averting injury to himself and his fellow soldiers. Unfortunately, he usually cannot speak or understand enough of the enemy language to question his captive. As a result, this information is usually not available to the soldier who needs it most and who is in the best position to obtain it.

This same inability to speak and understand enough of the enemy language to obtain similar information tends to

decrease the likelihood that troops will make an effort to escape if they are captured and confined. Lack of such elementary foreign language skills hampers troops not only in evasion and escape efforts, but also in resisting the enemy during confinement.

All previous attempts to solve these related combat communication problems have encountered administrative difficulties that have frustrated any systematic planning efforts. These difficulties stem mainly from the size of the potential student body which consists of all personnel who are in a position to capture or to be captured. Some of the administrative factors involved are: (a) Scarcity and cost of competent language instructors, (b) length of student training time in acquiring useful language skills, (c) lack of effective language training procedures for students of below average aptitude, and various others.

In view of the large numbers of possible students involved, the only feasible attack upon this problem was to develop a completely self-instructional programed foreign language course aimed at providing the prospective student with the ability to speak and understand enough of the enemy language to acquire low-level tactical information from newly captured prisoners. This capability should also be of value in the event of capture by the enemy.

The general definition of student skills desired led us to conduct a survey of combat-experienced soldiers to determine what questions these men had asked or wanted to ask newly captured POWs in a combat situation. Later target language experts and native speakers supplied the most probable answers to these questions. The target languages were Russian (2) and Mandarin Chinese (3). The course content, given here in English, was thus empirically derived and consisted of 11 commands, such as: "Drop weapon!" "Come here!" "Speak slowly!" six basic questions, such as: "Have you there?" "How many?" "What kind?" "Where?" 56 inserts, such as: "guns," "troops," "tanks," which could be combined with these questions, and 56 of the most probable answers to these questions.

With this content we were now in a position to define more specifically the terminal behavior required of the students. Two criteria were established, one, an academic, and one, a job performance criterion. The academic criterion consisted of student mastery of 75% or more of the course content as determined by objective tests of their ability to speak and understand all of the course material. The job performance criterion consisted of having the students successfully interrogate a native speaker in a simulated tactical combat situation. Meeting this criterion should

result in the acquisition of low-level tactical information that could be of use in helping the soldier carry out his mission and/or avert injury to himself and his fellow soldiers.

Having defined student terminal behavior as meeting these criteria, the next step was to arrange the course material in accordance with other concepts of programed instruction as they interacted with the linguistic, pedagogical, and practical aspects of the learning problem.

These concepts are generally accepted principles such as specifying student behavior desired,which has already been done, setting of subgoals, insuring active student responding, providing response feedback, response shaping, graduating response difficulty, estimating optimum response size, response-based course revisions and test for behavior acquisition. This is not an exhaustive list, nor will I try to cover all of these in detail, but most points will be touched upon in the following exposition.

First, the final desired student behavior, asking questions and understanding the answers, all in the target language, was roughly shaped by a first approximation which took the form of dividing the course into three sections. In Section A, the students first learned to understand all of the target language material that in Section B they learned to speak. In Section C they used this material that consisted mostly of questions as a logical setting in which to learn to understand the most probable answers to these questions.

Next, in order to insure active student responding, the material in these sections was divided into lessons and presented on tape following this general model. Each item in a lesson consisted of a stimulus (i.e. a command, a question, or an answer) with time for the student to respond, either by imitating the stimulus or by translating it. Then the correct response was presented, after which the student could score himself as correct, partly correct, or wrong, depending on how closely his response matched the correct response. For example, in teaching understanding, an item might consist of a Russian command with time for the student to translate it into English and then to listen to the correct English translation on the tape and compare what he said with the correct translation in order to score his response.

All items were made up of a command, question, or answer, so that every student response had some practical meaning attached to it. Using this sort of meaningful item made estimating the optimum size of the student response relatively easy. No student ever complained that the responses were too easy or too short, but student complaints and errors were

generally made where the student response contained too much material. The student response record could then be examined to locate items which were frequently missed and those items with inordinately long responses were usually divided into two items with two shorter responses.

Each lesson contained five lists of items, each having the same material to be learned, but presented in various orders and with progressively fewer cues. In the first list, each student response was given or prompted, so that all the student had to do was imitate it. In the second and third lists, the student had to construct his responses with much less assistance. In the fourth and fifth lists, no help whatsoever was given to the student.

Each one of these lessons had its own instruction sheet with a scoring layout on the reverse side so that every student response could be scored by the student thus providing us with a permanent record of his behavior.

One of the basic principles of language teaching is that repetition and over-learning are necessary and, it may be added, necessary evils. Two major ways were devised to introduce the desired repetition without incurring motivational decrement: First, the division of the course into three sections, A, B, and C, each with different objectives, provided a logical framework for exposure to continued repetitions of material by using this same material in all three sections for palpably different purposes. Second, the five-list format of each lesson with each list presenting the same material but varying both in order and in amount of cues provided repetition of material that students did not consider either boring or repetitive. Many other techniques for presenting this same material repeated were also utilized. For example, numbering each item in all of the lessons, forced the students to hear the target language numbers, one to 99, hundreds of times for a definite purpose - that of keeping track of where he was in the lesson.

Several techniques were used in an effort to keep students motivated so that they would continue to work on the intensive basis demanded by a course of this nature. In the beginning of the course the student was required to use only his native tongue, thereby assuring student capability of immediately producing and scoring correct responses. Use of graduated difficulty in programing a lesson assured initially correct responses in the first list plus a high probability of correct responses in subsequent lists. Graduated difficulty was defined in one major dimension as requiring the student to make shorter and then longer and longer responses and also using cognates where possible in the initial stages of learning. Confirmation of every correct student response was

considered a reinforcing process.

The criterion of learning used for every lesson, a correct English translation of the target language or a correct target language translation of the English on five consecutive lists, clearly structures the task and gives the student a reasonable goal to strive for with a definite feeling of completion and satisfaction when this goal is achieved. The scoring procedure by which a student marks his correct responses can also be considered a reinforcing procedure. The recognition that the present language course has a clear and achievable terminal point helps to spur the student on, or at least tends to prevent him from quitting. Division of the course into three sections or subgoals undoubtedly was an additional factor in achieving this terminal point.

Another procedure for maintaining motivation was to use teaching equipment that placed minimum demands on the student in going through the course. Equipment was selected to achieve the goals of effective material presentation through simple and easy equipment operation. There were four items, or categories, of equipment in the final course version. This material constitutes a training package that can be sent to any suitable location.

(1) Recorder equipment. These are earphone-equipped, four-track, tape recorders, modified to handle a tape cartridge with a maximum 600-feet tape capacity. The use of this cartridge eliminated threading tape into the reels and simplified the operation of the recorder.

(2) Taped course material. A set of tape cartridges covering the Russian and Chinese courses consists of 10 and 12 lesson cartridges respectively, with a running time of 8 and 10 hours plus two review cartridges for each course with a running time of two hours.

(3) Scoring equipment. A score sheet was printed on the reverse side of each instructional lesson sheet. Students used a metal stylus to punch their score sheets but a pencil would be just as effective.

(4) Printed course material. This category includes lesson sheets, general instructions, introductions to each of the three sections, study aids and other materials necessary for complete course administration which were duplicated for distribution to the students.

The next step after programing the courses and acquiring the described equipment was to conduct preliminary trials of the courses. After making the necessary revisions, the courses were administered to separate groups of students whose language

learning aptitude varied widely.

Complete printed directions for taking the course were issued to these students who then went through the course at their own speed without any other help. Students completed the courses in an average time of about 60 hours. They were then tested first on their ability to speak and understand all of the course material, and second, on their ability in a simulated combat situation to question a native speaker whom they had never seen and to translate his foreign language answers into English.

These test results were satisfactory; not only did the students do well on the academic type of tests, with scores ranging from 70-98% and averages in the high 80s and low 90s, but most important, in the job performance tests, they acquired a considerable amount of information that could have been very useful in an actual combat situation.

For example, in the simulated questioning test using native Russians in the role of POWs, the lowest scoring student obtained about 80% of the information given by the native Russian in answering his questions.

This information consisted of such elements as location of the immediate enemy, composition of enemy personnel, the number of tanks and other weapons, location of command posts, artillery, aircraft, rivers, bridges, railroads, towns, and other pertinent military items, including road conditions and hazards. The other students obtained even more information and in greater detail.

It was concluded that the students had acquired a language capability that could be of assistance in solving the military problems of combat communication described earlier.

Foreign language instruction and interrogation training has long been the accepted solution to this problem of information acquisition. The training courses described, while adequate for their special purposes, are relatively crude compared to the present capabilities in foreign language and interrogation training available in the United States Army. The usefulness of the research reported here has been in making this specialized training feasible for administration to the large numbers of military personnel for whom such training is appropriate.

A second military problem arose recently when events necessitated sending military personnel to Vietnam on rather short notice. In some cases it was not feasible to provide conventional Vietnamese language training for all personnel

involved. It was suggested that perhaps a brief self-instructional Vietnamese course would permit such personnel to acquire language skills that would enable them to function more effectively with Vietnamese nationals.

A short Vietnamese language course (4) was then programed following the programing principles previously mentioned. The objectives of the course were to enable the student to understand and speak selected functional terms and questions and answers in Vietnamese, as well as to have some insight into the sound system and structural aspects of the language so as to permit and encourage subsequent growth in his Vietnamese language ability. The content for this course was determined by surveying U.S. returnees from Vietnam. This content consisted of four general categories: queries for information, social amenities, advising terms, instructions, and commands. The equipment required for this course consists of dual-track student tape recorders to permit listening, record and playback modes, along with audio-active earphones and a student microphone. There are 50 lessons, each on a five-inch reel, consisting of 25 comprehension lessons alternating with 25 speaking lessons and nine review-combination lessons.

This course was evaluated with satisfactory results in a military setting. It was concluded that students acquired a Vietnamese language capability that should enable them to function more effectively in the general performance of their mission.

Time does not permit the elaboration of procedures designed to handle the many other programing concepts as well as the administrative and economic constraints involved in these self-instructional courses. These are factors such as maintenance or relearning of the language skills, cost and reliability of the equipment, operational methods of testing large numbers of students and many others.

I have described some attempts to utilize programed instruction procedures in special foreign language training situations. In other situations what programing principles will be used and how they will be put into effect will to a considerable degree be a function of the training objectives, the student population, and the prevailing administrative and economic constraints. Let me stress here that there is no one best way to program foreign language training, but that there are many poor and inefficient ways. The value of applying the generally accepted principles of programed instruction, as described previously, is that a basic efficiency in student learning is thereby assured, even for the less-experienced course constructor.

For increased efficiency in programing language instruction, some knowledge of linguistic principles would prove most helpful and some collaboration with linguists during course construction is highly recommended.

There have been many other applications of programed instruction techniques to language training by various organizations and individuals in the United States. Some of this work was reported at the International Conference of Modern Foreign Language Teaching at Berlin in 1964 and has been documented (5).

Research in programing general self-instructional Spanish and French courses is in progress at HumRRO and the Center for Applied Linguistics in Washington, D.C. This work is sponsored by the Defense Language Institute which has prime responsibility for foreign language training in the U.S. Department of Defense.

However, so much work and research in programing foreign language training materials has been and is in the process of being done, that the Defense Language Institute of the Department of Defense has by contract created a National Clearinghouse for Self-Instructional Language Materials at the Center for Applied Linguistics in Washington, D.C.[1/]

The functions of this clearinghouse are to collect (a) self-instructional language training materials (b) information on the use and evaluation of such materials and (c) information on research in self-instructional language programing. Another function of this clearinghouse is to provide coordination between institutions active in the development and research area and agencies interested in utilizing self-instructional language training programs.

First returns on a recent survey conducted by the Clearinghouse on use of self-instructional language programs indicates a user group of some 62 schools, colleges, and universities. Most of these institutions include considerable language instruction by live teachers in the school setting. The number of programed language courses sold to and used by individuals has been difficult to ascertain, but the proliferation of commercial organizations programing such materials seems to attest to the fact that such courses are being purchased in considerable quantity. The Clearinghouse plans to submit a final report covering all of the materials

1/ The Center for Applied Linguistics is a nonprofit professional organization established to serve as a clearinghouse and informal coordinating body in the application of linguistic science to practical language programs. It is located at 1775 Massachusetts Avenue, N.W., Washington, D.C., U.S.A.

that they have acquired to date with descriptive information concerning each program including, where possible, use and evaluations of these programs.

Now, the major problem in applying programed instruction to literacy training will be briefly discussed. Literacy training as used here means teaching adult native speakers to read their native language. In contrast to foreign language training, relatively little has been done in producing completely self-instructional literacy training programs in the United States. This may be due to (a) the easy availability of reading teachers, and (b) the fact that most self-instructional programs are predicated on the assumption that the student already has a reading capability.

Since the aim of the literacy program is to teach reading, the lack of such a capability hampers the degree to which programing principles can be effectively utilized in a literacy training course. Probably we are all familiar with conventional reading instruction that employs some programing principles to some degree while using teachers as the training medium. Present advances in programing literacy training are based on programing the activity of the live teacher to an ever-increasing degree as well as programing the learning activities of the student.

Perhaps the best examples of this approach are found in two literacy training programs developed for use in the United States. The first, now being experimentally used in Washington, D.C., is the Progressive Choice Reading Method devised by Dr. Woolman of the Institute for Educational Research in Washington, D.C. This program, while using live instructors has attempted to control the behavior of these instructors, by issuing to them a set of manuals, closely integrated with the students' programed workbooks. As their duties, the instructors present auditory stimuli, supply directions, evaluate responses, and provide reinforcement. Such instructors, though relatively untrained, must be literate and the program itself might easily be engineered so that the instructor and trainee use different parts of exactly the same program to bring about the final results. Some considerable success in teaching illiterates to read has been reported for the Progressive Choice Reading Program.

The second program, devised by the Diebold Group of New York City, was aimed at providing programed literacy instruction for a Negro population in Mississippi. Here the literacy training course took the form of a double track programed book with one track for the instructor or helper and one for the learner. To provide auditory stimuli, supply directions, assess aural responses, and provide oral

reinforcement the program was designed to utilize a literate helper from the language community of the learner. The helper's track requires programing as precise as the learner's. By careful testing and data analysis of learner and instructor interaction this double track program becomes a controlled tutorial situation. Satisfactory results have been reported in this Mississippi project.

The essence of programed instruction is the fine-grained control of the student learning environment and his subsequent behavior. The introduction of live instruction as an integral part of the program, dilutes, to some degree, such control and to that extent renders the program less effective. Then too, the necessary presence of an additional person, whether he is called "teacher" or "helper" compounds the special problems of an adult trainee.

While both of these literacy training programs discussed are notable advances in minimizing the dilution of student control by live instruction, the full application of programed instruction and its resulting effectiveness is yet to be realized in the programing of literacy training.

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